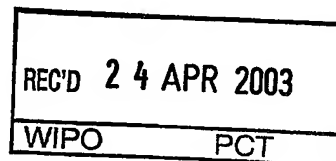


**REGISTRY OF PATENTS  
SINGAPORE**

This is to certify that the annexed is a true copy of the following Singapore Patent application as filed in this Registry.

Date of Filing : 16 DECEMBER 2002 (16-12-2002)  
Application number : 200207576-0  
Applicants : MALAYSIA WOODWORKING (PTE) LTD  
Title of Invention : FABRICATION OF HOLLOW DOOR  
USING MODULAR PANEL RIB  
COMPONENTS MADE FROM SCRAP  
WOOD



  
**Serene Chan (Miss)**  
Assistant Registrar  
For Registrar of Patents  
Singapore

15 April 2003

**PRIORITY DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
COMPLIANCE WITH  
RULE 17.1(a) OR (b)

## PATENTS FORM 1

Patents Act  
(Cap. 221)  
Patents Rules  
Rule 19

INTELLECTUAL PROPERTY OFFICE OF SINGAPORE

REQUEST FOR THE GRANT OF A PATENT UNDER  
SECTION 25

101101

\* denotes mandatory fields

## 1. YOUR REFERENCE\*

1237.P004/CKM/fmy

2. TITLE OF  
INVENTION\*

FABRICATION OF HOLLOW DOOR USING MODULAR PANEL  
RIB COMPONENTS MADE FROM SCRAP WOOD

## 3. DETAILS OF APPLICANT(S)\* (see note 3)

Number of applicant(s)

1

(A) Name

MALAYSIA WOODWORKING (PTE) LTD

Address

18 KRANJI LOOP  
SINGAPORE 739552

State

SG

Country

SG

☒

For corporate applicant

☐

For individual applicant

State of incorporation

SG

State of residency

Country of incorporation

SG

Country of residency

☐

For others (please specify in the box provided below)

(B) Name

Address

State

Country



☐

For corporate applicant

☐

For individual applicant

State of incorporation

State of residency

Country of incorporation

Country of residency

☐

For others (please specify in the box provided below)

(C) Name

Address

State

Country

☐

For corporate applicant

☐

For individual applicant

State of incorporation

State of residency

Country of incorporation

Country of residency

☐

For others (please specify in the box provided below)

☐

Further applicants are to be indicated on continuation sheet 1

**4. DECLARATION OF PRIORITY (see note 5)**

A. Country/country designated

File number

Filing Date

DD MM YYYY

B. Country/country designated

File number

Filing Date

DD MM YYYY

☐

Further details are to be indicated on continuation sheet 6

**5. INVENTOR(S)\* (see note 6)**

A. The applicant(s) is/are the sole/joint inventor(s)

Yes

☐

No

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16 DEC 2002

B. A statement on Patents Form 8 is/ was furnished

Yes

☒

No

☐

6. CLAIMING AN EARLIER FILING DATE UNDER (see note 7)

☐

section 20(3)

☐

section 26(6)

☐

section 47(4)

Patent application number

DD MM YYYY

Filing Date

Please mark with a cross in the relevant checkbox provided below  
(Note: Only one checkbox may be crossed.)

☐

Proceedings under rule 27(1)(a)

DD MM YYYY

Date on which the earlier application was amended

☐

Proceedings under rule 27(1)(b)

7. SECTION 14(4)(C) REQUIREMENTS (see note 8)

Invention has been displayed at an international exhibition. Yes

☐

No

☒

8. SECTION 114 REQUIREMENTS (see note 9)

The invention relates to and/or used a micro-organism deposited for the purposes of disclosure in accordance with section 114 with a depository authority under the Budapest Treaty.

Yes

☐

No

☒

9. CHECKLIST\*

(A) The application consists of the following number of sheets

i.	Request	<input type="text" value="5"/>	Sheets
ii.	Description	<input type="text" value="8"/>	Sheets
iii.	Claim(s)	<input type="text" value="3"/>	Sheets
iv.	Drawing(s)	<input type="text" value="4"/>	Sheets
v.	Abstract (Note: The figure of the drawing, if any, should accompany the abstract)	<input type="text" value="1"/>	Sheets
Total number of sheets		<input type="text" value="21"/>	Sheets

(B) The application as filed is accompanied by:

☐

Priority document(s)

☐

Translation of priority document(s)



Statement of inventorship  
& right to grant



International exhibition certificate

10. DETAILS OF AGENT (see notes 10, 11 and 12)

Name

Firm

LAWRENCE Y D HO & ASSOCIATES PTE LTD

11. ADDRESS FOR SERVICE IN SINGAPORE\* (see note 10)

Block/Hse No.

30

Level No.

07

Unit No./PO Box

01

Street Name

BIDEFORD ROAD

Building Name

THONGSIA BUILDING

Postal Code

229922

12. NAME, SIGNATURE AND DECLARATION (WHERE APPROPRIATE) OF APPLICANT OR AGENT\* (see note 12)  
(Note: Please cross the box below where appropriate.)

☒ X

I, the undersigned, do hereby declare that I have been duly authorised to act as representative, for the purposes of this application, on behalf of the applicant(s) named in paragraph 3 herein.

Name and Signature

DD MM YYYY

16 12 2002

**NOTES:**

1. This form when completed should be brought or sent to the Registry of Patents together with the rest of the application. Please note that the filing fee should be furnished within the period prescribed.
2. The relevant checkboxes as indicated in bold should be marked with a cross where applicable.
3. Enter the name and address of each applicant in the spaces provided in paragraph 3.  
Where the applicant is an individual
  - Names of individuals should be indicated in full and the surname or family name should be underlined.
  - The address of each individual should also be furnished in the space provided.
  - The checkbox for "For individual applicant" should be marked with a cross.Where the applicant is a body corporate
  - Bodies corporate should be designated by their corporate name and country of incorporation and, where appropriate, the state of incorporation within that country should be entered where provided.
  - The address of the body corporate should also be furnished in the space provided.
  - The checkbox for "For corporate applicant" should be marked with a cross.Where the applicant is a partnership
  - The details of all partners must be provided. The name of each partner should be indicated in full and the surname or family name should be underlined.
  - The address of each partner should also be furnished in the space provided.
  - The checkbox for "For others" should be marked with a cross and the name and address of the partnership should be indicated in the box provided.
4. In the field for "Country", please refer to the standard list of country codes made available by the Registry of Patents and enter the country code corresponding to the country in question.
5. The declaration of priority in paragraph 4 should state the date of the previous filing, the country in which it was made, and indicate the file number, if available. Where the application relied upon in an International Application or a regional patent application e.g. European patent application, one of the countries designated in that application [being one falling under section 17 of the Patents Act] should be identified and the country should be entered in the space provided.
6. Where the applicant or applicants is/are the sole inventor or the joint inventors, paragraph 5 should be completed by marking with a cross the 'YES' checkbox in the declaration (A) and the 'NO' checkbox in the alternative statement (B). Where this is not the case, the 'NO' checkbox in declaration (A) should be marked with a cross and a statement will be required to be filed on Patents Form 8.
7. When an application is made by virtue of section 20(3), 26(6) or 47(4), the appropriate section should be identified in paragraph 6 and the number of the earlier application or any patent granted thereon identified. Applicants proceeding under section 26(6) should identify which provision in rule 27 they are proceeding under. If the applicants are proceeding under rule 27(1)(a), they should also indicate the date on which the earlier application was amended.
8. Where the applicant wishes an earlier disclosure of the invention by him at an International Exhibition to be disregarded in accordance with section 14(4)(c), then the 'YES' checkbox at paragraph 7 should be marked with a cross. Otherwise, the 'NO' checkbox should be marked with a cross.
9. Where in disclosing the invention the application refers to one or more micro-organisms deposited with a depository authority under the Budapest Treaty, then the 'YES' checkbox at paragraph 8 should be marked with a cross. Otherwise, the 'NO' checkbox should be marked with a cross. Attention is also drawn to the Fourth Schedule of the Patents Rules.
10. Where an agent is appointed, the fields for "DETAILS OF AGENT" and "ADDRESS FOR SERVICE IN SINGAPORE" should be completed and they should be the same as those found in the corresponding Patents Form 41. In the event where no agent is appointed, the field for "ADDRESS FOR SERVICE IN SINGAPORE" should be completed, leaving the field for "DETAILS OF AGENT" blank.
11. In the event where an individual is appointed as an agent, the sub-field "Name" under "DETAILS OF AGENT" must be completed by entering the full name of the individual. The sub-field "Firm" may be left blank. In the event where a partnership/body corporate is appointed as an agent, the sub-field "Firm" under "DETAILS OF AGENT" must be completed by entering the name of the partnership/body corporate. The sub-field "Name" may be left blank.
12. Attention is drawn to sections 104 and 105 of the Patents Act, rules 90 and 105 of the Patents Rules, and the Patents (Patent Agents) Rules 2001.
13. Applicants resident in Singapore are reminded that if the Registry of Patents considers that an application contains information the publication of which might be prejudicial to the defence of Singapore or the safety of the public, it may prohibit or restrict its publication or communication. Any person resident in Singapore and wishing to apply for patent protection in other countries must first obtain permission from the Singapore Registry of Patents unless they have already applied for a patent for the same invention in Singapore. In the latter case, no application should be made overseas until at least 2 months after the application has been filed in Singapore, and unless no directions had been issued under section 33 by the Registrar or such directions have been revoked. Attention is drawn to sections 33 and 34 of the Patents Act.
14. If the space provided in the patents form is not enough, the additional information should be entered in the relevant continuation sheet. Please note that the continuation sheets need not be filed with the Registry of Patents if they are not used.



## **FABRICATION OF HOLLOW DOOR USING MODULAR PANEL RIB COMPONENTS MADE FROM SCRAP WOOD**

### **Field of the Invention**

[0001] The present invention relates wooden hollow doors fabricated with parts of scrap wood and wood composites.

[0002] In particular, the present invention relates to a hollow door using modular panel rib components and the method of fabricating the hollow door.

### **Background of the Invention**

[0003] At present, hollow doors are constructed primarily of wood or wood composites. Such doors have a frame defining the shape and size of the door with panels or "skins" that form the two flat vertical sides of the door.

[0004] The hollow core of the door has ribs or spacers between the skins to give the door structural strength while keeping the overall weight of the door low.

[0005] The spacers are usually made of a flexible honeycomb of paper or cardboard, glued to the skins of the door.

[0006] While materials used may differ, similar methods of fabrication have also applied to partition panels, signboards, cabinets, writing (white or black) boards, table-tops, floors and ceiling panels, all of which utilize the same construction: that of panels separated by spacers.

[0007] One problem with using virgin wood strips as is the cost and weight. In addition, wood is getting scarce. One way to reduce reliance on virgin wood material is to substitute it with paper or cardboard as a spacer material. However, paper and cardboard is susceptible to moisture and dampness.

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[0008] Another problem is that significant portion of the cost of the items is due to the manufacturing cost of the paper or cardboard honeycombs as specialized equipment are needed.

[0009] These problems in the current art are especially ironic since carpentry factories and workshops fabricating hollow doors and other furnishings generate a lot of off-cuts or scrap wood. Left unused, this scrap wood is usually disposed of as waste.

### **Summary of the Invention**

[0010] The present invention seeks to provide a method to render scrap wood or wood composites into modular components for the manufacture of wood hollow doors.

[0011] In particular, the present invention teaches methods for the rendering scrap wood or wood composites into modular components of panel ribs, elements of the present invention, for the manufacture of hollow wooden doors.

[0012] In another aspect, the present invention is a hollow door fabricated according to the methods of the present invention.

### **Brief Description of the Drawings**

[0013] A preferred embodiment of the present invention will now be more fully described, by way of example, with reference to the drawings of which:

[0014] FIG. 1 illustrates two hollow doors with the panel or "skin" from one side is partially removed to expose the hollow core of the door occupied by a honeycomb of paper one (FIG. 1A) and a modular latticework made from scrap wood in the other (FIG. 1B);

[0015] FIG. 2 shows the method of making panel ribs from short pieces of scrap wood using notches and connector blocks;



[0016] FIG. 3 shows the method of fastening panel ribs to a connector block in a radial pattern using conventional woodworking fasteners;

[0017] FIG. 4 shows how panel ribs may be joined with a notched connector; and

[0018] FIG. 5 shows two possible lattice arrangements in hollow doors under the present invention.

### **Detailed Description of the Drawings**

[0019] In accordance with the present invention, methods of rendering scrap construction or manufacturing materials, particularly off-cuts from wood and wood composites into modular components, and a preferred embodiment of the invention, fabrication of a hollow door, are described.

[0020] In the following description, details are provided to describe the preferred embodiment. It shall be apparent to one skilled in the art, however, that the invention may be practiced without such details. Some of these details may not be described at length so as not to obscure the invention.

[0021] Here, all reference to wood material also refers to wood composites. Similarly, references to paper also refer to cardboard. As in the industry, the panels of the hollow doors are also referred to as "skins" in the present application.

[0022] The terms "connector" and "connector block" are also used interchangeably in the present invention. Both are used to join modular components to form panel ribs.

[0023] One aspect of the present invention is a method of rendering scrap wood into modular components for the assembly of panel ribs. This is done by making use of various ways to connect the modular components into a latticework of panel ribs to replace the paper or cardboard honeycomb between panels of the finished product.

[0024] While hollow doors may be made of materials other than wood, the present invention is directed to the panel ribs of hollow doors and similar

products made of wood and wood composite. However, hollow doors fabricated of materials other than wood or wood composite but utilizing the method taught in the present invention are within the scope and spirit of the present invention.

[0025] There are many advantages of the present invention. One advantage is that scrap wood may be used as panel ribs. Scrap wood or waste wood is also called "off-cuts". These are the remnants of wood left over from furniture manufacturing. They come in odd sizes and are usually of lengths too short to be useful for other purposes and are usually disposed of as waste.

[0026] This invention teaches methods of rendering these short pieces of scrap wood into useful components for panel ribs, the invention also teaches methods to join these components into useful configurations for use in hollow doors and similar furnishings.

[0027] By advantageously utilizing this hitherto useless material, the need to dispose of this scrap wood by either burning or dumping is greatly reduced, allowing the present invention to contribute in reducing impact on the environment.

[0028] Another advantage of the present invention is that wood, especially wood composite, is more moisture resistant than paper or cardboard. When used as panel ribs, the final product is more durable in damp or humid environments.

[0029] Hollow doors made with wood panel ribs are structurally stronger than those made with paper or cardboard honeycomb.

[0030] While heart of the invention is the idea of joining modular pieces of wood into panel ribs, the various methods of joining the strips of wood are encompassed by the scope of the present invention. Some examples of joining the wood strips through the use of an engagement member (strip) and a complementary engagement member (connector) are taught below.

[0031] Referring now to FIG. 1A and 1B, a door made with a paper honeycomb 1.10 is compared with another made with panel ribs 1.12 as taught in the present invention.

[0032] In FIG. 2, it can be seen that short pieces or strips of wood 2.10 are joined with complementary notches. These engagement members and their complementary engagement members are elements of the present invention.

[0033] One way to join short strips of wood is through the use of corresponding half notches 2.12 cut into the strips of wood. Multiple strips of wood may be joined side by side by using notches 2.14 that are correspondingly as wide as the thickness required.

[0034] While the joining of panel ribs with each other or with connector blocks are shown as notches 2.12 and 2.14, tongue-and-groove or mortise-and-tenon type joints (not shown) may also be used.

[0035] Another way to join strips of off-cuts is by the use of connector blocks (FIG. 3). Such connector blocks may be rectangular, circular or polygonal in cross-section and be of varying thickness. The use of connector blocks gives greater latitude to the pattern of latticework possible and hence greater usage of scrap wood.

[0036] For example, as may be seen in FIG. 3, a hexagonal 3.10 or circular connector will allow panels ribs to be joined in a radial pattern. In FIG 3, the strips are joined to connector block 3.10 by means of conventional woodworking fasteners such as nails 3.12, tacks, screws or angle plates.

[0037] Components described may join at angles to form a "T" joint, an "L" or "V" joint or a rectangle.

[0038] Connector blocks also allow end-to-end joining of panel ribs to form a longer strip of wood (FIG. 4). A connector that is notched 4.16 may be readily joined to both strips with 4.17 or without notches 4.18 at the ends. Means other than notches, mortise-and-tenon joints may be used to join these modular components under the present invention.

[0039] The complementary structures of these components cited above allow these components to be connected without the need for adhesives. This lowers costs and speeds up production.

[0040] Similarly, instead of using the methods or modular components described above, the engagement members may also be joined by the connecting means with conventional woodworking fasteners such as nails, tacks or screws.

[0041] FIG. 5A and 5B show two arrangements of latticework fabricated under the scope of the present invention. The panel ribs may be formed from a mixture of dedicated ribs 5.10 (eg the vertical continuous strips) of virgin, non-scrap wood, and scrap wood 5.12 (the diagonal ribs) or entirely of scrap wood 5.14 with the methods of joining described above. FIG. 1B is an example showing another possible arrangement of latticework under the present invention.

[0042] Even with the use of some virgin material, scrap wood still forms the bulk of the present invention, making it extremely environmentally friendly.

[0043] To practise this invention, the method of joining strips with notches is described as the preferred embodiment. Similar fabrication procedures and a combination of the joining methods, while not described in detail, may also be used.

[0044] Simple settings of a rip saw fence arrangement should first be determined and set up. This will generate useful strips of uniform width and thickness from the scrap wood.

[0045] Then a jig indicating the intervals at which to cut the notches should be used to determine where the notches should be cut. Although elaborate jigs may be used for this, a simple marked straight edge may also suffice.

[0046] Strips with notches cut at regular intervals are then rendered from scrap wood using the above arrangements.

[0047] Thus a ready supply of these modular components of uniformly cut strips, may be generated for the fabrication of hollow doors.

[0048] A hollow door is assembled as usual with the frame placed over the skin or panel of one side and this arrangement secured. A latticework of panel ribs may be assembled in place, in the hollow of the door.

Alternatively, the lattice may be assembled on a schematic of the frame and then placed in the hollow defined by the frame as a complete component.

[0049] The edges of the panel ribs in contact with the skin are painted with a suitable adhesive and the panel ribs placed in contact with the skin.

[0050] Again, wood glue or a suitable adhesive applied to the other exposed narrow edges of the panel ribs. With the use of half notches, the latticework of scrap wood need not be secured by any adhesive as contact with the skins of the door will keep them in place.

[0051] The skin of the other side is then place over the hollow such that both skins contact the adhesive. The skins are then held to the frame and panel ribs by presses until the glue has cured.

[0052] When the glue or adhesive has dried or cured, the door is trimmed and finished.

[0053] It will be apparent to anyone of ordinary skill in the art that the procedure of fabricating a hollow door may be varied significantly without affecting the finished product or departing from the scope of the present invention.

[0054] Again, it will be appreciated by anyone of ordinary skill in the art that handling the latticework of panel ribs is significantly easier than a manipulating a honeycomb of paper or cardboard.

[0055] The present invention is also non-obvious and entailed an inventive step, as apparent from the lack of prior art teaching the use of rendering and joining scrap wood strips into usable panel ribs for hollow doors.

[0056] The different latticework of panel ribs may be varied to suit the requirements of the door. If a stronger door is required, a denser arrangement of panel ribs with more cross-linked members may be used.

[0057] It will also be appreciated by anyone concerned with the environment that maximizing the use of scrap wood in the present invention is

environmentally friendly and will reduce the use of virgin material for the fabrication of hollow doors and products of similar construction.

[0058] While a wood hollow door is described, it will also be apparent to one of ordinary skill in the art that the invention may also be practiced in the fabrication of other furnishings and structures such as hollow partition panels, cabinets, writing boards, desk and table tops, and signboards, all of which utilize similar methods of construction and are hence within the scope of the present invention.

[0059] Various improvements, particularly to methods of joining the panel ribs together, may also be made without departing from the scope of the present invention.

**CLAIMS**

1. A method of fabricating hollow doors of wood material with at least one panel rib joined from modular components rendered from scrap wood material, said modular components comprising engagement members, complementary engagement members and connecting means.
2. A method in accordance to Claim 1, said joining of said panel rib's said engagement members and said complementary engagement members do not require adhesive due to complementary structures of said engagement members and said complementary engagement members.
3. A method in accordance to Claim 1, said method further comprises joining modular components of inadequate individual dimensions to form a panel rib, such that panel ribs of adequate dimensions may be fabricated.
4. The method according to Claim 1, wherein said engagement members and said complementary engagement members comprise notched components that can be joined one to another.
5. A method in accordance to Claim 1, said method further comprises assembling a latticework comprising panel ribs formed from modular components, and other components formed from non-scrap wood material.
6. A method in accordance to Claim 5, said method of assembling said latticework may be performed within a frame for a hollow door.
7. A method in accordance to Claim 5, said method of assembling said latticework may be performed before placing said latticework into a frame for a hollow door.
8. A method in accordance to Claim 5, said method of assembling said latticework permit latticeworks of different configurations to be readily formed.

9. A method to use scrap wood material for modular components to form at least one panel rib in the fabrication of hollow structures and furnishings.
10. A hollow door of wood material with at least one panel rib joined from modular components rendered from scrap wood material, said modular components comprising engagement members, complementary engagement members and connecting means.
11. A hollow door in accordance to Claim 10, said joining of said panel rib's said engagement members and said complementary engagement members do not require adhesive due to complementary structures of said engagement members and said complementary engagement members.
12. A hollow door in accordance to Claim 10, said panel rib further comprises modular components of inadequate individual dimensions to form said panel rib, wherein joining of said modular components allow panel ribs of adequate dimensions to be fabricated.
13. A hollow door in accordance to Claim 10, said engagement members and said complementary engagement members comprise notched components that can be joined one to another.
14. A hollow door in accordance to Claim 10, said connecting means comprise fasteners.
15. A hollow door in accordance to Claim 10, said hollow door further comprises a latticework of panel ribs formed from modular components, and other components formed from non-scrap wood material.
16. A hollow door in accordance to Claim 15, said latticework may be assembled within a frame for a hollow door.
17. A hollow door in accordance to Claim 15, said latticework may be pre-assembled before placing said latticework into a frame for a hollow door.



18. A hollow door in accordance to Claim 15, said method of assembling said latticework permit latticeworks of different configurations to be readily formed.
19. A hollow structure with at least one panel rib formed from at least one modular component made from scrap wood material.



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**TITLE****FABRICATION OF HOLLOW DOOR USING MODULAR PANEL  
RIB COMPONENTS MADE FROM SCRAP WOOD****ABSTRACT**

A method to use scrap wood and wood composites is described for the construction of hollow doors. Scrap wood pieces are used to form panel ribs in the hollow core of the door. As scrap wood pieces are usually too short for other purposes, the present invention teaches means to connect these strips into useful lengths by the use of notches, connector blocks and conventional fasteners. This invention is environmentally friendly as it will reduce the impact on the environment by reducing the amount of scrap wood or wood composites that will otherwise be incinerated or dumped.

FIG. 2 accompanies the abstract.



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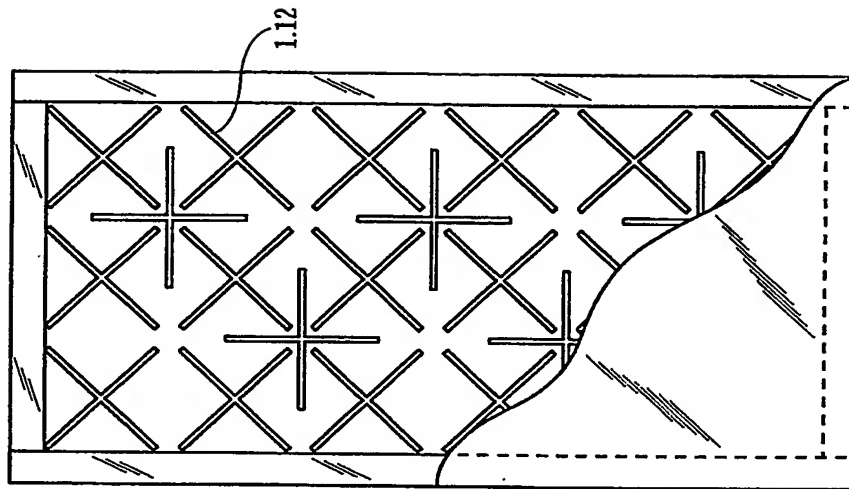


FIG. 1B

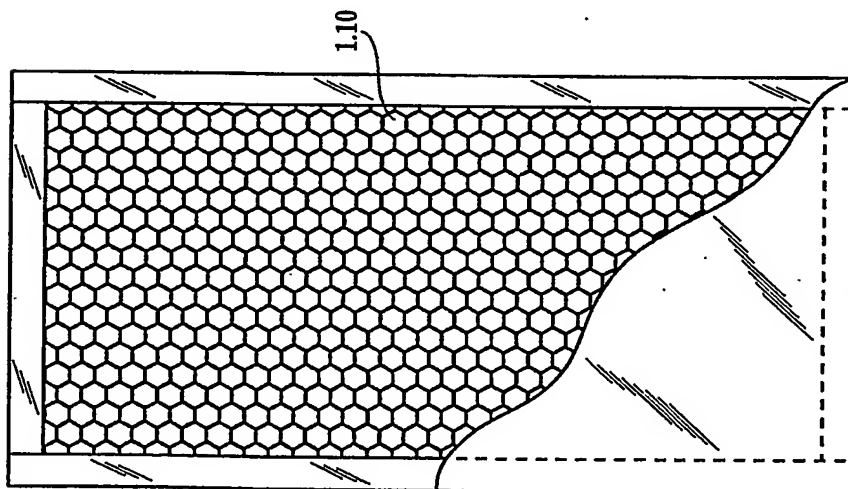
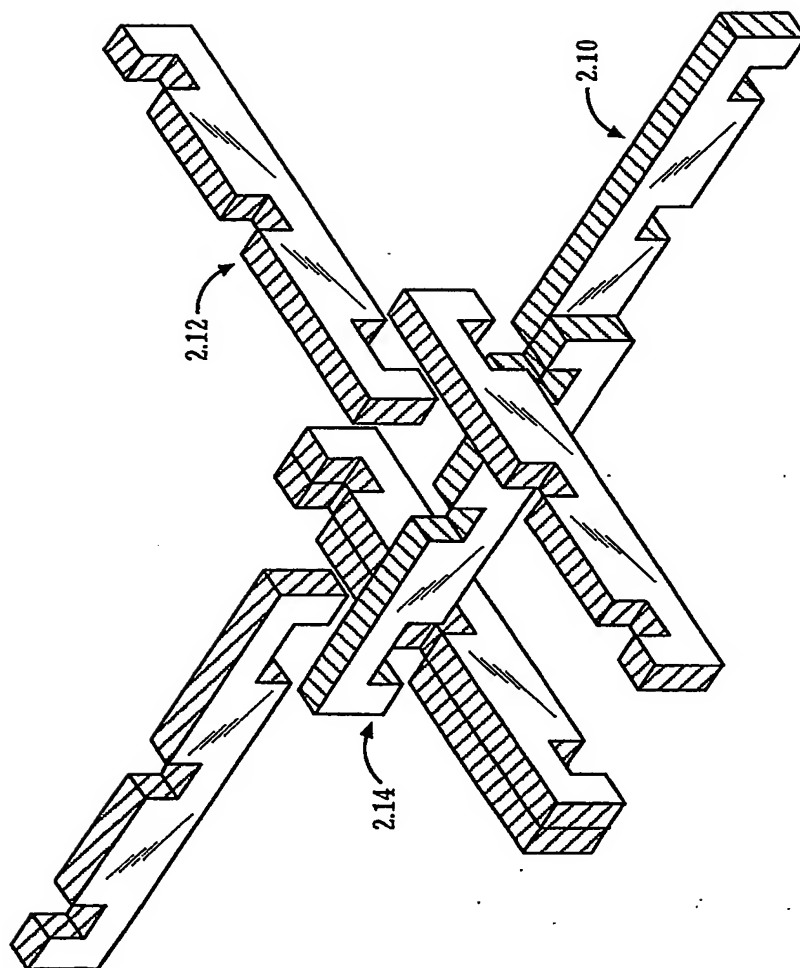
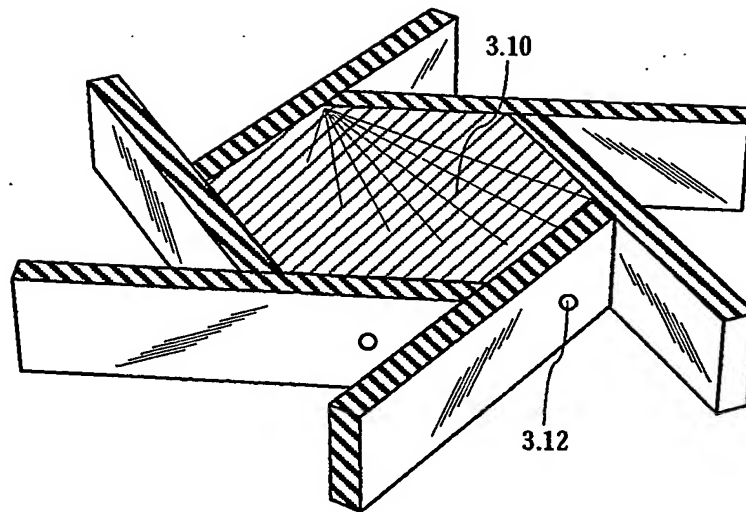


FIG. 1A

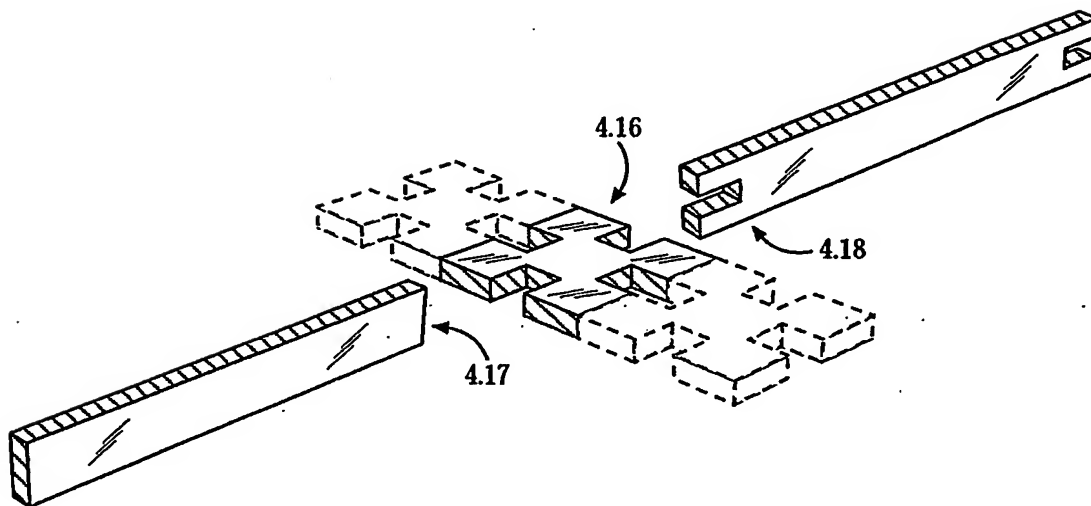


**FIG. 2**

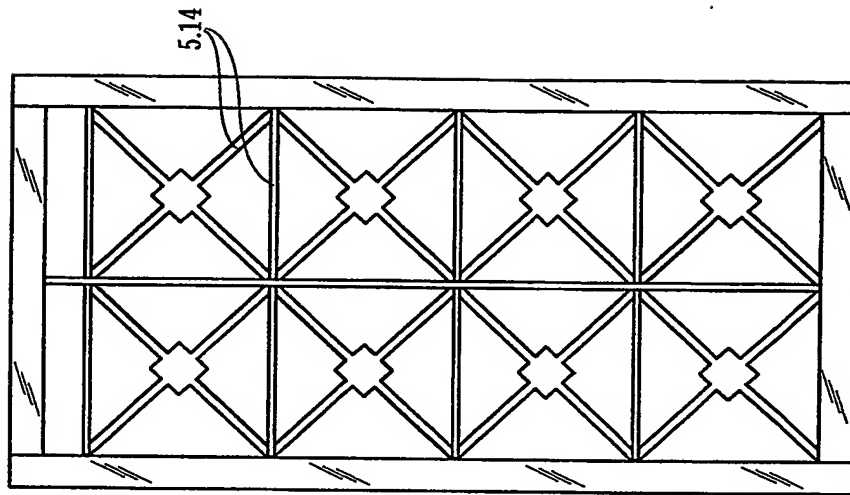
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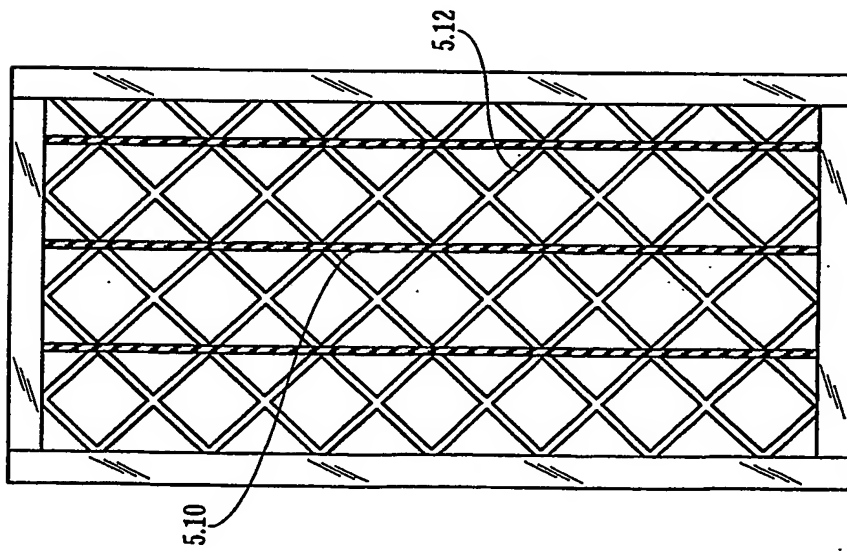
**FIG. 3**



**FIG. 4**



**FIG. 5B**



**FIG. 5A**